Washington State Department of Health
Office of Environmental Health & Safety
Indoor Air Quality Program

PUBLIC HEALTH
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Formaldehyde Fact Sheet

Formaldehyde (HCHO) is a colorless, flammable gas with a pungent suffocating odor. It is the most important aldehyde produced commercially, and is used in the preparation of urea-formaldehyde and phenol-formaldehyde resins. It is also produced during the combustion of organic materials and is a component of smoke.

Health Impacts

Health effects associated with exposure to HCHO fall into several categories. These include: irritant effects, sensitization, and carcinogenicity. HCHO is intensely irritating to the mucous membranes, which includes membranes of the eyes and respiratory tract. Common symptoms from exposure to HCHO include: burning eyes, nose and throat, headache, and less commonly nausea. HCHO has the potential to sensitize exposed individuals, which can involve both asthma symptoms and skin reactions. Some people exposed to HCHO will develop asthma symptoms. These symptoms include wheezing and chest congestion. Urticaria (a skin condition marked by intensely itching wheals usually caused by an allergic reaction) has been reported following inhalation of HCHO fumes. HCHO can be considered a sensitizing agent. Documentation of this effect has been seen in dialysis patients, as well as persons chronically exposed to low levels in mobile homes. HCHO has been designated as a probable human carcinogen, and has also been designated as a workplace carcinogen by the National Institute for Occupational Safety and Health (NIOSH).

U.S. Occupational Safety and Health Administration (OSHA) and Washington State Department of Labor and Industries workplace regulations call for exposures which do not exceed 0.75 parts per million (PPM) as an eight hour time weighted average (TWA), with a 0.5 PPM action level, and a 2 PPM short term exposure limit (STEL) for 15 minutes. NIOSH recommends a 0.016 PPM eight hour TWA and a 0.1 PPM 15 minute ceiling. The American Council of Governmental Industrial Hygienist recommend a ceiling of 0.3 PPM.

No residential standard exists in Washington State. The American Society of Heating, Refrigeration, and Air Conditioning Engineers recommends a maximum continuous indoor air concentration of 0.1 PPM. Other states and several foreign countries have guidelines or standards for residential indoor air exposures which range from 0.1 to 0.5 PPM.

Sensitive Populations

Odor threshold ranges from 0.05 PPM to 1 PPM. At concentrations of 0.05 to 0.5 PPM HCHO produces a definable sensation of eye irritation. In occupational studies, reports of eye tearing, prickling, stinging, and burning are reported at levels from 0.13 to 2.7 PPM. Airway irritation has been reported as low as 0.1 PPM, but more commonly occurs in ranges of 1 to 11 PPM. Symptoms range from the feeling of a dry throat, tingling of the nose, and sore throat. However, airway irritation (at concentrations of 5-30 PPM) is

characterized by cough, chest tightness, and wheezing. Chronic industrial exposure to concentrations ranging from 0.5 to 8.9 PPM produced changes in the nasal and pharyngeal mucosa, and complaints of throat irritation, diminished sense of smell, and dryness of the throat and pharynx. HCHO has been associated with both the development of asthma and the initiation of asthma attacks. High levels (50-100 PPM) have been associated with swelling of the lung and movement of fluid into the lung, as well as pneumonia. Exposures to levels greater than 100 PPM can be fatal.

Sources

The major sources in residential settings are building materials. These products may contain phenol, urea, thiourea, or melamine resins which contain HCHO. HCHO has also been used in the paper, photographic, and clothing industries. It is used in the finishing of all permanent press material, and can be found in the glues used in furniture construction or carpet and vinyl attachments.

Urea-formaldehyde resin containing products are the most common HCHO source in the home. This formulation is approved for interior grade materials such as plywood, hardwood cabinetry, and wall paneling. Urea-formaldehyde resins release trapped free HCHO as well as HCHO resulting from chemical degradation. Degradation of HCHO resins can occur when these materials become damp from exposure to high relative humidities, or if the HCHO materials are saturated with water during flooding, or when leaks occur. The release of HCHO occurs when the acid catalysts involved in the resin formulation are reactivated. Levels of out-gassing increase with increasing temperatures and relative humidity.

Prevention

The prevention of problems associated with exposure to HCHO are best treated by source control. The selection of HCHO free or low-emitting products such as exterior grade plywood which use phenol HCHO resins for indoor use is the ideal starting point.

Alternatives to source control include: filtration, sealants, and fumigation treatments. Filtration can be achieved using selected adsorbents. Sealants involve coating the materials in question with two or three coats of nitro-cellulose varnish, or water based polyurethane. Three coats of these materials can reduce out-gassing by as much as 90 percent. Professional carrier gas treatment with ammonia will also minimize HCHO out-gassing.

Testing for HCHO can be accomplished with passive monitors, real time active monitors, or colorimetric sorbent tubes. Passive monitors can be purchased through industrial hygiene suppliers or through independent contractors who manufacture their own monitors. For listings in your area look in the phone book under analytical laboratories or environmental services.

For More Information about formaldehyde:

- Local Health Department (http://www.doh.wa.gov/LHJMap/LHJMap.htm).
- US Environmental Protection Agency, IAQ Publications/Resources (http://www.epa.gov/iaq/pubs/index.html) 1-800-438-4318.
- Washington State Department of Labor & Industries, Health and Safety Consultation (non-residential problems) (http://www.lni.wa.gov/Safety/Basics/Assistance/Consultation/default.asp) 1-800-547-8367.
- Washington State Department of Health, Indoor Air Quality Program (residential problems) (http://devwww/ehp/ts/IAQ.HTM) 360-236-3363 or 1-888-586-9427.